

# Clean Outdoor Air

*Health Objectives for the Year 2010: Maintain achievement of the National Ambient Air Quality Standards in Lincoln–Lancaster County. Assess health risk posed by emissions of hazardous air pollutants from stationary, area, and mobile sources. If that risk becomes unacceptably high, reduce emissions.*

## Health Implications

A substantial federal regulatory program exists to assure that health risks from outdoor air pollution are minimized. The U.S. Environmental Protection Agency (EPA) delegates to state and local agencies, such as the Lincoln–Lancaster County Health Department, the responsibility to conduct many of the assurance activities associated with federal regulations, such as monitoring air quality, writing permits for new and existing air pollution sources, inspecting for compliance, inventorying air emissions, and taking enforcement action against non-compliers. With the exception of measuring the actual level of pollution in the air, these activities are, at best, secondary or tertiary measures of exposure potential, health risk, or disease caused by air pollution.

Every breath can expose individuals to a dose of air pollution which – depending on the chemical, concentration, and individual sensitivity – has the potential to cause or increase the risk of adverse health effects. These health effects include acute respiratory system or eye irritation, chronic respiratory disease or asthma, cancer, and serious chronic organ dysfunction. Epidemiological

studies have demonstrated that the mortality rate due to cardiopulmonary problems is elevated in cities even with levels of airborne fine particulate matter even lower than the current ambient air quality standards. Exposure to moderate levels of ambient ozone can cause breathing changes even in healthy adults, but asthmatic children especially are at increased risk of respiratory problems from ozone. Hazardous air pollutants include many types of chemicals, exposure to which can increase the risk of cancer, adverse reproductive effects, or other organ disease. The toxicology of many of these individual hazardous air pollutants is poorly understood, although their individual effects have been documented from the high exposures seen in occupational settings. However, even more poorly understood are the cumulative effects of being exposed simultaneously to a host of pollutants, such as occurs in an urban setting.

There are indirect or potential human health risks from dirty air. Air pollution that persists in the environment, such as metals and pesticides, can deposit on water or land and accumulate through

**Table 1. Clean Outdoor Air Indicators**

	Lancaster Recent	Lancaster Objective 2010	Nebraska Recent	Nebraska Objective 2010	National Recent	National Objective <sup>1</sup>
Measured levels of ozone <0.12 ppm (for any one hour) and <0.08 ppm (for any eight hours)	Att. <sup>2</sup>	Maint.	Att. <sup>3</sup>	--	Not Att. <sup>4</sup>	Att. by 2012
Measured levels of carbon monoxide <35.0 ppm (for any one hour) and <9.0 ppm (for any eight hours)	Att. <sup>2</sup>	Maint.	Att. <sup>3</sup>	--	Not Att. <sup>4</sup>	Att. by 2005
Measured levels of fine particulate <65 ug/m3 (for any 24 hours) and <15.0 ug/m3 (annual)	Att. <sup>2</sup>	Maint.	Att. <sup>3</sup>	--	Not Att. <sup>4</sup>	Att. by 2017
Annual emissions of criteria air pollutants from stationary mobile and area sources remain at 2000 levels or decline (in tons)	13,977.9 <sup>5</sup>	Maint./Re.	109,042.2 <sup>6</sup>	--	390 million <sup>7</sup>	--
Annual emissions of hazardous pollutants from stationary, area and mobile sources remain at 2000 levels or decline (in tons)	1,322.2 <sup>5</sup>	Maint./Re.	831.0 <sup>6</sup>	--	8,100,100 <sup>8</sup>	Re. 75% by 2010 <sup>9</sup>
Cancer and non-cancer health risks from hazardous air pollutants are within acceptable risk levels <sup>10</sup>	--	--	--	--	--	--

**Att.** = Attained    **Maint.** = Maintain attainment    **Not Att.** = Not attained    **Re.** = Reduce levels

the food chain, resulting in contaminated fish, which pose a human health risk by ingestion. Accidental releases of certain chemicals, which are sometimes stored in large quantities, such as chlorine or anhydrous ammonia, can pose a severe public health risk.

In addition to health effects on human populations, air pollution can adversely impact ecosystems and the general environment. Emissions of sulfur dioxide over time have acidified lakes in areas with soils that have poor buffering

capacity, making the lakes unable to support life. Emissions of freons have accumulated in the stratosphere and deteriorated the ozone layer, which serves to deflect ionizing radiation from the sun. Finally, an increasing body of scientific evidence indicates that increasing emissions of “greenhouse gases,” such as carbon dioxide, have the potential to change the earth’s climate in several ways that can adversely affect human life (i.e., average temperature, rainfall, and the intensity of weather events).

## Current Status and Trends

Air quality in Lincoln–Lancaster County is relatively good, based on current assessment, but some aspects need more assessment. The Clean Air Act, which LLCHD administers, currently focuses on criteria pollutants and hazardous air pollutants (HAP). Criteria pollutants are seven chemicals that are the “criteria” by which good air quality is defined, based on whether the measured concentrations of these chemicals in an area exceed national health-protective standards. National Ambient Air Quality Standards (NAAQS) have been established for carbon monoxide, particulate matter less than 10 microns in size (PM10), ozone, nitrogen oxides, sulfur dioxide, lead, and particulate matter less than 2.5 microns in size (PM2.5). Monitoring determines the amount of these pollutants in Lincoln–Lancaster County air compared to the standards.

LLCHD monitors for carbon monoxide, a pollutant which results from fuel combustion (most importantly from vehicles) continuously year round. Ozone, a pollutant that is formed in the air in the presence of sunlight from a combination of nitrogen oxides and volatile organic compounds, is monitored continuously during the ozone season, which is April 1 to October 31. LLCHD samples for PM2.5 once every

third day. This pollutant comes mainly from combustion of fuel or other materials. Monitoring for PM10 was discontinued in 1998 after a decade of results indicating that the level was consistently no more than 50% of the NAAQS limit. Similarly, monitoring for nitrogen oxides and sulfur dioxide was discontinued in the late 1970s after almost a decade of results showed low levels. LLCHD does not monitor for lead because there are no significant sources in Lancaster County.

The HAP class of chemicals is a specific list of 188 pollutants, also called air toxics, which have the potential to cause cancer or other serious acute and chronic health effects. There are no health-based ambient standards for these chemicals, although there are established guideline levels that represent minimal health risk. The focus of most of the rules on toxic air pollution is to minimize emissions of these chemicals into the air with the expectation that health risk will proportionally be reduced.

Emissions of criteria pollutants and hazardous air pollutants come from industrial and business activities, fuel combustion, unpaved roads, and from automobiles, trucks, construction equipment, trains, and airplanes. Currently, 116 businesses and opera-

tions are regulated under air pollution rules in Lancaster County. In addition to regulatory activities, LLCHD actively promotes voluntary action by air pollution sources to reduce emissions through the use of pollution prevention. This approach has been successful in reducing air toxics emissions from industrial and business activities beyond what regulations require and would probably be the best way to reduce greenhouse gas emissions. Only EPA has the authority to regulate emissions from vehicles, equipment, trains, and planes by setting emission standards for different types of engines. However, a local agency can implement programs to reduce vehicle use, which results in lower emissions overall from mobile sources.

The following air quality trends have been either measured in Lincoln–Lancaster or have implications for our community:

- ♦ Lincoln–Lancaster County air quality meets national health standards – for now. LLCHD monitors the level of three criteria pollutants: carbon monoxide, ozone, and PM<sub>2.5</sub>. The measured levels of carbon monoxide and ozone continue to be below (often well below) the health protective NAAQS. Sufficient data on PM<sub>2.5</sub> has yet to be collected to determine officially if levels exceed the standard. Across the United States, the more populated an urban area becomes, the more likely it is to have levels of criteria pollutants (particularly ozone) that exceed the NAAQS. Most metropolitan areas above 500,000 population exceed at least one NAAQS.
- ♦ The trend in stationary source emissions is level or declining. Emissions of criteria pollutants from stationary sources of air pollution have remained relatively constant over the past five years. Emissions of HAP (the 188 toxic chemicals identified in the Clean Air Act) from stationary air pollution sources have decreased 53% since 1994, mostly through voluntary pollution–prevention actions by large air-pollution sources to decrease usage of HAP-containing solvents, paints, and other chemicals.
- ♦ The national air toxics program is shifting its focus to risk reduction. Although the federal air toxics program has been focused on reducing HAP emissions through specific control standards for certain stationary source types, EPA's focus is shifting to assessing which sources contribute most to public health risk. Once those are identified, a strategy will be developed to reduce emissions based on what will reduce that risk to the greatest extent. This strategy will rely in part on assessments done at the local level and then on state and local air toxics programs to accomplish the risk reduction.
- ♦ Vehicle emissions may pose the greatest health risk, but assessment is needed. The trend in air pollution emissions from mobile sources is unknown. LLCHD will complete a mobile source inventory this year. However, a computer modeling study done by EPA indicates that levels of some HAP chemicals in Lincoln's air may significantly exceed health benchmarks. Most of the pollutants predicted to be at high levels in the study are those typically emitted by vehicles. LLCHD plans to complete a comprehensive emission inventory, which will include mobile and area sources of air toxics, and conduct its own refined analysis of health risks posed by HAPs. In areas of the country (both urban and rural) where air monitoring for HAPs has been conducted, the pollutants most frequently measured at levels of concern are the mobile source toxics. This is true even in highly industrialized urban areas.
- ♦ Cars are running cleaner, but people are driving more. Population growth in Lincoln–Lancaster County has been

about 1.1% per year. The increase in vehicle miles traveled has been about 3% per year. The more vehicle miles traveled, the more potential for air pollution from vehicles. Also, the most popular private vehicles (mini-vans, sport-utility vehicles, and pickups) currently have less stringent emission standards than those for cars. Although federally required emission controls on automobiles have been becoming more stringent, at some point the increasing number of vehicle miles traveled may offset the reduced air pollution from each individual vehicle. Requirements for emission controls on heavy-duty engines in trucks, construction equipment, tractors, locomotive engines, and airplanes are just now being established.

- ♦ Greenhouse gases? The local trend in carbon dioxide and other “greenhouse gas” emissions from fuel combustion, transportation and agricultural production is unknown because these emissions have not been inventoried.
- ♦ Lincoln–Lancaster County enjoys a high rate of compliance with air pollution rules. All new air pollution sources of a certain size apply for and quickly receive authorization to construct processes that have appropriately minimized air pollution. Stationary air pollution sources of any significant size have or will soon have an air quality operating permit that

lays out all the rules applying to their business or operation. Most receive an annual inspection. Typically 96% of these pollution sources are in compliance. Out of approximately 150 asbestos demolition/renovation projects conducted annually to which the federal asbestos regulations apply, the compliance rate is typically 97%. Businesses or operations that manufacture, store, or use a certain amount of chemicals that have the potential to cause catastrophic off-site health effects if those chemicals were accidentally released are required to develop Risk Management Plans to minimize the possibility that accidents might happen and to mitigate the effects of a release. In Lincoln–Lancaster County, many of these are small businesses that store ammonia or propane. The compliance rate with this rule is 91%.

- ♦ Community air pollution concerns are health-related. Some Lincoln–Lancaster County residents (including regulated businesses, neighborhood associations, government, and the general public) were surveyed on their concerns, expectations, and hopes for clean air in 2010. They were mainly concerned about the adverse health effects that air pollution can cause. The top-ranking goals were to reduce air pollution from all sources, to maintain the NAAQS, and to reduce health risk posed by air toxics.

### Health Disparities

Determining whether racial and ethnic minorities are disproportionately affected by air pollution is a matter of identifying either exposure levels to air pollutants present in minority neighborhoods or, at least, the presence of air pollution sources in those neighborhoods. Monitoring for criteria pollutants is conducted at sites that represent the

highest expected concentrations. Years of monitoring continue to show low levels of pollution even at these potential “hot-spot” locations. Results from PM<sub>2.5</sub> monitoring, which is conducted at a site expected to be typical of city-wide exposure levels, are not yet available for analysis.

An EPA computer modeling study was

completed in 1998, which predicted concentrations of HAP within each census tract from stationary, mobile, and area source HAP emissions. By mapping these concentrations using the Geographic Information System (GIS), total HAP concentrations were shown to vary among the census tracts. Minority census tracts were in the low to medium

range for total HAP concentrations. The census tracts with the highest total HAPs were not those minority neighborhoods, but were more highly correlated with transportation corridors. The conclusion drawn from this information is that minority communities in Lincoln do not appear to be disproportionately affected by air pollution.

## Public Health Infrastructure

In general, the infrastructure for assuring clean air within Lincoln–Lancaster County is well developed. LLCHD implements the federal regulatory program as well as promotes pollution prevention through non-regulatory approaches. Funding for air quality activities is generally adequate. Approximately 20% of the program is funded through federal money passed through from the state Department of Environmental Quality. Fees paid by regulated air pollution sources fund the remainder. A source pays based on the amount of air pollution it emits annually. LLCHD believes that this fee structure is another way of encouraging emission reductions. However, we have already experienced revenue loss as a result of emission reductions. The department had to compensate by establishing fees for all regulated sources, rather than just a few. As the program continues to be successful in reducing emissions, the fee structure may have to be revised.

In addition to funding, another infrastructure issue relates to authority to require risk reduction. In some states and localities, regulations exist that require a source of an unacceptable health risk posed by emissions of air toxics to reduce those emissions. LLCHD has a requirement that if a new stationary source of air pollution will emit a threshold amount of any of the air toxics, that source must use the best available control technology to minimize emissions. However, this does not apply to existing sources nor to mobile sources. If a desired clean air goal is to reduce risk from air toxics, a mechanism to do so will have to be identified. This mechanism may be an enhanced voluntary program that encourages risk reductions, a clarification of whether the general public health protection authority of the Health Director applies to the situations, or the establishment of new regulations.

## Recommendations

- ♦ The overarching recommendation is to protect the relatively good air quality that Lincoln–Lancaster County enjoys and prevent future air-quality problems.
- ♦ Continue to implement the federal Clean Air Act as a way of assuring that the NAAQS will not be exceeded and that air toxics emissions will be minimized.
- ♦ Assess how much air pollution is emitted by cars, trucks, construction equipment, planes, and rail locomotives (i.e., mobile sources).
- ♦ Participate in the Metropolitan Planning Organization to monitor and

influence how Lincoln and its transportation system grow; advocate for transportation and land-use decisions that avoid adverse impacts on air quality.

- ♦ Assess air toxics risk by conducting a comprehensive inventory of emissions from stationary, mobile and area sources (i.e., small, broadly distributed air pollution sources such as vehicle fueling, painting, and auto-

body repair facilities) followed by exposure modeling. Air toxics monitoring is another method of identifying exposure levels. Assess the health risk and identify the sources that contribute most to that risk. Use health benchmarks as a way of evaluating if unacceptable risk from air toxics exposure exists. If so, establish and implement a risk-reduction plan.

Notes

Related discussion or indicators are located in the chapters on *Toxic and Hazardous Materials* and *Public Health Emergency Management*.

Table 1

- Currently no data source.
- 1. U.S. Environmental Protection Agency, *EPA Strategic Plan*, September 1997.
- 2. Lincoln–Lancaster County Health Department, *Air Monitoring Data*, December 1999.
- 3. Nebraska Department of Environmental Quality, *Nebraska Air Quality Reports*, 1998.
- 4. *National Air Quality and Emissions Trends Report*, 1997.
- 5. Lincoln–Lancaster County Health Department, *Air Program*, 1998 data from Emissions Inventory (stationary sources only).
- 6. Nebraska Department of Environmental Quality, 1998 data from the Emission Inventory.
- 7. *National Air Quality and Emissions Trends Report*, 1997 data from only stationary sources.
- 8. *National Air Quality and Emissions Trends Report*, 1993 data from only stationary sources.
- 9. Based on 1993 levels.
- 10. Currently no data source. Could be obtained through air quality measures, modeling, risk assessment, and setting of community–accepted risk levels. See Public Health Infrastructure section for discussion of measurement methods based on national risk assessment methodology.